APPENDIX

The accuracy of UV-Vis absorbances were studied by using two methods. One is to determine the absorbance of a series of solutions of potassium permanganate which contain manganese concentrations in the range 0 to 30 mg/L. Another is by determining the absorbance and the wavelength using the standard cells.

Table 18 Reading comparison of the absorbance of potassium permanganate and the reference

Concentation of Mn (mg/L)	**Measured Abs. at 522 nm**	**Reference Abs. at 522 nm**	**Measured Abs. – Reference Abs.**
5.00	0.21	0.20	0.01
10.00	0.42	0.41	0.01
15.00	0.63	0.63	0.00
20.00	0.83	0.82	0.01
30.00	1.23	1.22	0.01

Table 19 Reading comparison of the absorbance of standard cells and the reference

Reference absorbance				Measured absorbance			
Ho_2O_3 Glass	NG11	NG5	NG4	Ho_2O_3 Glass	NG11	NG5	NG4
279.25	440 (0.263)	440 (0.504)	440 (0.988)	279.20	440.36 (0.314)	440.36 (0.556)	440.36 (1.025)
360.85	465 (0.235)	465 (0.464)	465 (0.919)	361.53	465.76 (0.285)	465.76 (0.514)	465.76 (0.954)
453.50	546 (0.237)	546 (0.483)	546 (0.948)	453.50	546.34 (0.277)	546.34 (0.521)	546.34 (0.967)
536.25	590 (0.252)	590 (0.521)	590 (0.991)	536.25	590.14 (0.275)	590.14 (0.543)	590.14 (0.998)
637.35	635 (0.255)	635 (0.508)	635 (0.947)	637.44	635.68 (0.280)	635.68 (0.508)	635.68 (0.948)

Table 20 Complex formation of curcumin-metal complexes from three experiments

Complex	Complex formation ($\log K$)		
	first	second	third
Curcumin-Hg(II)	4.60	4.27	4.44
Curcumin-Cu(II)	9.83	10.00	9.67
Curcumin-Ni(II)	8.83	8.06	9.08

Table 21 Formation constants of metal ion complexes of $EDTA^{4+}$

Ion	***log K***	**Reference**
Al^{3+}	16.30	*Ben Best, 1990*
Ba^{2+}	7.73	*Whitburn, et. al, 1999*
Ca^{2+}	10.70	*Whitburn, et. al, 1999*
Cd^{2+}	16.62	*Whitburn, et. al, 1999*
Co^{2+}	16.49	*Whitburn, et. al, 1999*
Cu^{2+}	18.86	*Whitburn, et. al, 1999*
Fe^{2+}	14.32	*Ben Best, 1990*
Fe^{3+}	25.10	*Ben Best, 1990*
Hg^{2+}	21.80	*Whitburn, et. al, 1999*
K^{+}	0.80	*Ben Best, 1990*
Mg^{2+}	8.65	*Whitburn, et. al, 1999*
Mn^{2+}	13.95	*Whitburn, et. al, 1999*
Na^{+}	1.66	*Ben Best, 1990*
Ni^{2+}	18.67	*Whitburn, et. al, 1999*
Pb^{2+}	18.30	*Whitburn, et. al, 1999*
Sr^{2+}	8.60	*Whitburn, et. al, 1999*
Zn^{2+}	16.68	*Whitburn, et. al, 1999*

Table 22 Stability constants of aqueous complex ions (*Plambeck, 1995*)

Ion	log K
$Ag(CN)^{2-}$	20.40
$Ag(NH3)^{2+}$	7.22
$AgCl_2^-$	5.14
$Al(OH)_4^-$	33.52
$Cd(CN)_4^{2-}$	18.29
$Cd(NH_3)_4^{2+}$	7.44
$Co(NH_3)_6^{3+}$	23.13
$Cu(CN)_3^{2-}$	28.62
$Cu(CN)_4^{3-}$	33.02
$Cu(NH_3)_4^{2+}$	12.36
$Fe(CN)_6^{3-}$	52.61
$Fe(CN)_6^{4-}$	45.62
$Fe(SCN)_2^+$	2.96
$HgCl_4^{2-}$	15.12
$Hg(CN)_4^{2-}$	41.26
$Hg(SCN)_4^{2-}$	21.70
HgI_4^{2-}	29.75
$Ni(NH_3)_6^{2+}$	8.95
$Pb(OH)_3^-$	13.92
$Zn(CN)_4^{2-}$	16.76
$Zn(NH3)_4^{2+}$	8.56
$Zn(OH)_4^{2-}$	15.60